

# **UPDATES ON AMPHIBIAN MONITORING EFFORTS IN THE MID-ATLANTIC**

**Cacapon State Park  
Wednesday, March 26, 2003  
12:00 - 5:00 p.m.**

## **Amphibian Monitoring Programs**

- 12:00**            **Incorporating Stream Salamander and Vernal Pool Amphibian Monitoring into Mid-Alantic State Programs** - *Robin Jung, USGS - BRD*
- 12:30 p.m.**    **North American Amphibian Monitoring Program/Amphibian Calling Surveys in the Mid-Atlantic** - *Linda Weir, USGS - BRD*
- 1:00 p.m.**      **Herpetofaunal Species Richness and Relative Abundance in a Reclaimed Mountaintop Mine Landscape** - *Jennifer Mravintz Williams and Petra Bohall Wood, WV Cooperative Fish and Wildlife Research Unit, BRD, USGS and Division of Forestry, West Virginia University*
- 1:30 p.m.**      **Stream Plethodontid Assemblage Response (SPAR) Index** - *Gian Rocco, Penn State University*

## **Integration of Amphibian Monitoring into State Programs**

- 2:00 p.m.**      **Using Salamander Species to Assist in the Determination of Aquatic Life Use Designations for Primary Headwater Habit Streams in Ohio** - *Bob Davic, Ohio EPA*
- 2:30 p.m.**      **Amphibian Monitoring in the Maryland Biological Streams Survey - Current Practices and Future Direction** - *Mark Southerland, Versar, Inc.*
- 3:00 p.m.**      **BREAK**
- 3:30 p.m.**      **Status of Stream Salamanders in the New River Drainage in West Virginia** - *Thomas K. Pauley and Mark B. Watson, Biology Department, Marshall University*
- 4:00 p.m.**      **Stream Salamanders as Potential Indicators of Headwater Stream Quality in West Virginia** - *Michael S. Osbourn, Linh D. Phu, Thomas K. Pauley, Biology Department, Marshall University, and Jeffrey E. Bailey, West Virginia Division of Environmental Protection*

**4:30 p.m.      Amphibians As Indicators of Wetland Condition in Ohio and Development of an Amphibian Index of Biotic Integrity - Mick Micacchion, Ohio EPA**

**5:00 p.m.      Roundtable Discussion on Successes, Failures and Future Plans for Incorporating Amphibian Monitoring into State Programs - Panel of All Speakers**

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*ABSTRACTS*

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**Incorporating Stream Salamander and Vernal Pool Amphibian Monitoring into mid-Atlantic State Programs**

Robin E. Jung, Ph.D., Coordinator of the Amphibian Research and Monitoring Initiative (ARMI) in the Northeast Region, USES Patuxent Wildlife Research Center, 12100 Beech Forest Rd., Laurel, MD 20708. 301-497-5875, robin\_jung@usgs.gov

According to Vial and Saylor (1993), amphibians experiencing the greatest declines in the northeastern United States are those that breed in small (first- and second-order) streams and vernal (or ephemeral) pools. Small streams and vernal pools often do not receive protection at the state or federal level, so amphibians reliant on these habitats may be particularly at risk for declines.

During the past two years, the northeastern region of the U.S. Geological Survey's Amphibian Research and Monitoring Initiative (ARMI) has helped fund stream salamander surveys conducted alongside state stream monitoring programs in Maryland and West Virginia. In collaboration with Dr. Mark Southerland (Versar, Inc.) and the Maryland Department of Natural Resources, we surveyed 76 Maryland Biological Stream Survey sites for stream salamanders. With funding from the EPA and ARMI, Dr. Tom Pauley (Marshall University) surveyed 33 West Virginia Department of Environmental Protection stream sites for salamanders. These efforts are helping to develop stream salamander indices of biotic integrity that may be particularly useful for small streams that support salamander but not fish populations. Stream salamander survey work in Pennsylvania (Dr. Gian Rocco and Robert Brooks) may also be incorporated into state monitoring efforts.

Whereas Massachusetts, New Hampshire, and Maine have vernal pool certification programs in place, mid-Atlantic states are lagging behind in vernal pool documentation and protection efforts. In partnership with the US Fish and Wildlife Service and the National Park Service, NE ARMI is conducting egg mass counts of wood frogs and spotted salamanders at 16 Refuges and 4 Parks in the northeastern United States. In 2003, NE ARMI is working with partners in Montgomery County, Maryland to develop a pilot vernal pool certification and monitoring program that could serve as a model for the state of Maryland and potentially other states within the mid-Atlantic.

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### **North American Amphibian Monitoring Program (NAAMP): an amphibian calling survey**

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The North American Amphibian Monitoring Program (NAAMP) is a collaborative effort among regional partners, such as state natural resource agencies and nonprofit organizations, and the U.S. Geological Survey (USES) to monitor populations of vocal amphibians (frogs and toads) to determine population trends and distribution information. NAAMP is active in over 20 states, primarily in the eastern United States. The calling survey is conducted along roadside routes 3 to 4 times during the breeding season depending on regional calling phenology. State partners and USES are interested in population trends at a state-wide perspective, as well as larger regional scales (e.g., Northeast). For larger states it may be possible to examine population trends at regional scales within the state (e.g., Wisconsin driftless area). Calling survey data may facilitate updates in distribution information by providing potential locations to voucher or otherwise document new county or location records. States are also interested in providing increased amphibian awareness and potential for volunteer base to contribute to nongame programs or sponsoring organization. Strengths and weaknesses of the survey will be discussed within the context of future directions of NAAMP

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### **Herpetofaunal Species Richness and Relative Abundance in a Reclaimed Mountaintop Mine Landscape**

Jennifer Mravintz Williams and Petra Bohall Wood, West Virginia Cooperative Fish and Wildlife Research Unit, BRD, USES, and Division of Forestry, West Virginia University, Morgantown, WV 26506-6125. Phone: (304)293-2941 X 2318 (JW); X 2433 (PW). Email: [jwilli19@mix.wvu.edu](mailto:jwilli19@mix.wvu.edu); [pbwood@wvu.edu](mailto:pbwood@wvu.edu)

Effects of mountaintop mining on terrestrial herpetofauna have not been well documented. Habitat suitability of reclaimed mountaintop mines in southern West Virginia was determined by comparing species richness and abundance of herpetofauna in pre- and post-mining landscapes during March and May-October of 2000-2002 using drift fence arrays with pitfall and funnel traps in terrestrial habitats. The pre-mining landscape was represented by relatively intact forest, the dominant land cover in the region, while reclaimed grassland, reclaimed shrub/pole, and forest fragment treatments represented the post-mining landscape. To further determine habitat suitability of the reclaimed treatments, species richness and abundance of terrestrial herpetofauna on reclaimed grassland and shrub/pole habitats were compared with structurally similar habitats in unmined areas. Stream surveys were conducted in fragmented forest streams and intact forest streams in 2002 to sample streamside salamanders. Colonization rates and movement distances of terrestrial salamanders from forests onto reclaimed habitat were examined using coverboards from 2001-2002.

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### **Stream Plethodontid Assemblage Response (SPAR) Index: Development, Application, and Verification in the MAHA**

Gian L. Rocco and Robert P. Brooks, Penn State Cooperative Wetlands Center, The PA State University, University Park, PA. 814-865-2180

Amphibians in general are considered to be valuable response indicators. A diverse assemblage of Plethodontid (lungless) salamanders inhabit small streams in the Appalachian Region, where they can occur in extremely high densities, have stable populations, are geographically widespread, have diverse life histories, and function as both predator and prey. In this study their use as bio-indicators is explored by (1) describing the range and variability of stream Plethodontid assemblage responses (SPAR) across natural and commonly encountered gradients of anthropogenic degradation in the Mid-Atlantic Highlands Area (MAHA), (2) developing, applying, and verifying SPAR metrics for use in MAHA headwaters, and (3) evaluating volunteer SPAR-use proficiency.

Stream Plethodontids were sampled at 138 EMAP stream sites from May - August, in 2000-2002. The EMAP Mid-Atlantic Highlands wadeable stream sites were originally selected by a randomized, probability-based design, covering a broad range of ecological conditions. A large data set of ecological information is also available for each site. The SPAR EMAP watersheds varied from 0.1 - 3 km<sup>2</sup> basin-area, 0 - 100 percent forest cover, 0-100 percent agricultural cover, and from 65 m - 1,167 m elevation. Stream chemistry was also highly variable. Evaluation of potential SPAR metrics began in the fall of 2000 and is ongoing. In general, presence of stream Plethodontids correspond with macroinvertebrate communities indicative of high water quality.

Volunteer training was conducted in June 2002. It was attended by 65 individuals representing 41 volunteer groups; five, one-day long training sessions were presented. Training included pre-training and post-training tests with live stream plethodontids, presentation of key distinguishing characteristics of PA stream plethodontids, time period for examination of live specimens, and discussion of SPAR sampling and specimen/voucher processing. Scores for the 39 volunteer groups in the pre-training and post-training tests ranged from 7.7 - 83.3% (mean 48.9%, range 75.6%) and from 53.6 - 100% (mean

81.3%, range 46.4%), respectively. Only 39 groups completed both tests. Thus, training improved average test scores by 32.2% and narrowed the range of scores by 29.2%. Volunteer proficiency varied by salamander lifestage and taxonomic resolution. Ultimately, the goals of individual monitoring programs will dictate the level of taxonomic resolution necessary, the focus of future training efforts, and the design and implementation of quality assurance protocols.

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### **Using Salamander Species to Assist in the Determination of Aquatic Life Use Designations for Primary Headwater Habitat Streams in Ohio**

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The Ohio EPA has recently developed a tiered biological assessment methodology to determine the aquatic life use potential of primary headwater habitat (PHWH) streams (methods, technical reports, data available online at: <http://www.epa.state.oh.us/dsw/wqs/headwaters/index.html>). In Ohio, PHWH streams are defined as those with watershed areas less than 1.0 mi<sup>2</sup> (259 ha), with maximum pool depths less than 40 cm. The biological assessment procedure involves qualitative presence/absence sampling for benthic macroinvertebrates, fish, and salamanders along 200 foot length of thalweg. The biological data can be used to assign one of three potential aquatic life use designations as allowed under the Clean Water Act: (1) Class I-PHWH stream (ephemeral adapted biotic community); (2) Class II-PHWH stream (warm water adapted community); and (3) Class III-PHWH stream (cold water adapted community). Salamander collections are an important component of the stream classification procedure.

Numerous salamander species replace fish as the dominant vertebrate predator functional group in headwater lotic ecosystems, and evidence of their reproduction (larvae, eggs, good mix of juveniles-adults) can be used to assist in determining PHWH stream class where fish are rare or not present. In Ohio, salamander species from the family Plethodontidae, tribe Hemidactyliini, with long-lived larval periods 12 to 48 months in duration are associated with the cold permanent flow associated with spring-fed Class III-PHWH streams. These Class III-PHWH streams also have present a high number of cold water adapted benthic macroinvertebrate taxa, and high macroinvertebrate species diversity. Class III-PHWH salamander indicator species that are associated with these cold water macroinvertebrates assemblages, and include the two-lined complex (*Eurycea bislineata*, *E. cirrigera*), cave salamander (*Eurycea lucifuga*), some populations of the long-tailed salamander (*Eurycea longicauda*), spring salamander complex (*Gyrinophilus p. porphyriticus*, *G. p. duryi*), northern red salamander (*Pseudotriton r. ruber*), and the midland mud salamander (*Pseudotriton montanus diasticus*). Salamander species with larval periods less than 12 months, which are adapted to reproduction in lotic habitats that may become seasonally dry, can be used to assign a Class II-PHWH use designation when Class III salamander species are not present. In Ohio, Class II-PHWH stream indicator species are represented by the salamander genera *Ambystoma*, *Desmognathus*, *Hemidactylium*. Complete absence of salamander species from PHWH streams must be evaluated in conjunction with data from the benthic macroinvertebrates, hydrology, quality of the of the physical

habitat, and potential chemical pollution. I will discuss how these Ohio methods can be modified for use throughout North America to help assign biologically meaningful primary headwater stream aquatic life uses under the Clean Water Act in geographic areas where stream adapted salamander species are present, but fish are rare or absent.

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## **Amphibian Monitoring in the Maryland Biological Stream Survey: Current Practice and Future Prospects**

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The Maryland Department of Natural Resources (DNR) implements the Maryland Biological Stream Survey (MBSS) as a primary mechanism for determining the condition of freshwater resources in the State and addressing the cumulative stresses they face. Since 1994, the MBSS has conducted sampling of more than two-thousand 75-meter stream segments throughout the State. During 1994-1999, 15-minute timed searches for amphibians and reptiles were conducted on both sides of the stream to a distance of 5 meters. In 2000, the sampling protocol was modified such that only amphibian and reptiles incidentally encountered during electrofishing or other MBSS sampling were recorded. During the 1995-1997 MBSS, new county records were discovered for 5 amphibian and 3 reptile species.

Even though the assemblages of amphibians and reptiles associated with streams and their riparian areas are not as distinct as fish and benthic macroinvertebrate communities (and only species presence was recorded), we determined that selected species richness metrics for amphibians and reptiles in the MBSS data were reasonably effective discriminators (80%) of reference and degraded conditions in the Highlands and Piedmont regions of Maryland. We also investigated the options for developing a more robust indicator for stream salamanders, because their diverse life histories and stable populations make them effective indicators of water quality and riparian degradation, especially where fish assemblages are depauperate or absent. We determined that 15-m x 2-m transects and 4-m<sup>2</sup> plots were effective monitoring methods for collecting quantitative data on salamander assemblages, but that leaf litter bags and electrofishing were not warranted. We produced a stream salamander Index of Biotic Integrity (SS-IBI) for the Highlands and Piedmont combined that had a classification efficiency of 90%, based on four metrics: number of salamander species, number of salamanders, percentage of intolerant salamanders, and number of adult salamanders. A comparison of the classification efficiency at reference sites (using strict criteria) of the number-of-salamander-species metric alone indicated poorer performance with less rigorous sampling: 88% correct with targeted salamander searches, 57% with MBSS riparian searches, and 26% with incidental encounters.

The current data being collected by the MBSS on amphibians will continue to be valuable information on the geographic distribution and trends in Maryland herpetofauna. Community data and the ability to distinguish high-quality streams, however, appear dependent on sampling rigor (and may require additional training). The resumption of MBSS riparian searches would necessitate allocating an

additional 5% of sampling effort to each site; addition of targeted salamander searches would require closer to 10% more sampling effort. Although the parameters that can be sampled by the MBSS are limited by funding constraints, Maryland DNR is considering including more amphibian sampling effort in the next round to begin in 2005. If this is not possible, future amphibian monitoring could be targeted to specific regions or ecosystem types, such as small streams in rapidly developing areas.

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### **Status of Stream Salamanders in the New River Drainage in West Virginia**

Thomas K. Pauley and Mark B. Watson, Biology Department, Marshall University, Huntington, WV 25755. 304-696-2376

Since 1989, inventories for stream salamanders have been conducted in tributaries of the New, Bluestone, Greenbrier, Meadow, and Gauley rivers. Inventories were part of two studies in which the objectives were to determine salamander species present. One study funded by the U.S. Park Service involved searching first to third-order streams in the New River Gorge National River, Bluestone Scenic River, and Gauley River Recreational Area. The second study, funded by the West Virginia Division of Natural Resources, was part of work to develop an Amphibian and Reptile Atlas of West Virginia and involved searching streams in areas where inventories have not been reported in the literature or specimens are not listed by museums. We will report on the range, distribution, and ecological status of 5 species of *Desmognathus*, 3 species of *Eurycea*, one species of *Gyrinophilus*, and one species of *Pseudotriton*.

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### **Stream Salamanders as Potential Indicators of Headwater Stream Quality in West Virginia**

Osbourn, Michael S., Linh D. Phu, Jeffrey E. Bailey, and Thomas K. Pauley Marshall University and West Virginia Division of Environmental Protection

Stream salamanders are currently being examined throughout West Virginia for their potential as bioindicators of stream quality. In small headwater streams, where predatory fish are absent, stream salamanders are often found in high densities and are the primary vertebrate predators. Their sensitivity to environmental stressors may make salamanders good indicators of overall stream health. Study streams were randomly determined by the West Virginia Division of Environmental Protection and evaluated using watershed assessment protocols. Marshall University field crews followed WVDEP with salamander surveys throughout Spring, Summer, and early Fall 2002. We compared stream salamander species richness and abundance to habitat variables, land-use, water chemistry, and benthic macroinvertebrates bioindicators to determine correlations. This ongoing study will assist managers in developing a scoring system for stream salamanders as bioindicators and help to evaluate the impacts of disturbance on populations in West Virginia.

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## **Amphibians As Indicators of Wetland Condition in Ohio and Development of an Amphibian Index of Biotic Integrity**

Mick Micacchion, Wetlands Ecology Group, Ohio Environmental Protection Agency, Division of Surface Water, 122 S. Front Street, Columbus, Ohio 43215. 614-644-2327

Sixty-seven natural emergent, shrub and forested depressional wetlands were monitored for amphibian usage during the breeding season between the years 1996-2000 in the Eastern Corn Belt Plains and Erie/Ontario Lake and Drift Plains ecoregions of Ohio (glaciated Ohio). Wetlands monitored spanned the range of human disturbance from least impacted (reference) to severely degraded as determined using the Ohio Rapid Assessment Method for Wetlands Version 5.0 (ORAM 5.0). The 27 emergent wetlands in the study were almost entirely comprised of tolerant amphibian species. This uniform composition of the amphibian communities at emergent sites suggests that amphibians are not good bioindicators for this wetland class because these wetlands do not support the diversity of amphibian species adapted to the historic Ohio landscape which was 95% forested. Attributes of the amphibian communities in the 40 shrub and forested wetlands were used to develop a multi-metric Amphibian Index of Biotic Integrity (AmphIBI) comprised of five metrics: the Amphibian Quality Assessment Index; number of pond-breeding salamander species; relative abundance of sensitive taxa; relative abundance of tolerant taxa; and presence of spotted salamanders (*Ambystoma maculatum*) or wood frogs (*Rana sylvatica*). A strong correlation exists between ORAM 5.0 scores and AmphIBI scores (df=39, F=48.01, p<0.001, R-sq=55.8%). Comparing AmphIBI scores to just the ORAM 5.0 metrics that measure the intactness of a wetland provides a stronger correlation (df=39, F=62.79, p<0.001, R-sq=62.3%). For the shrub and forest wetlands monitored in this study the AmphIBI is a good predictor of overall wetland condition.

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